WE CLAIM:

1. A chemical vapor deposition (CVD) device comprising

a deposition reaction chamber;

a plasma discharge chamber that is provided remotely from the reaction chamber; and

a piping that links the reaction chamber and the remote plasma discharge chamber,

wherein energy coupled to the remote plasma discharge chamber activates cleaning gas within the plasma discharge chamber, and the activated cleaning gas is brought into the inside of the reaction chamber through the piping and changes solid substances adhered to the inside of the reaction chamber as a consequence of film formation, to gaseous substances, thereby cleaning the inside of the reaction chamber,

wherein internal surfaces of the piping comprises a metal not corroded by the activated cleaning gas species.

2. The CVD device according to Claim 1, wherein the activated cleaning gas comprises fluorine active species.

3. The CVD device of Claim 2, wherein the internal surface of the piping comprises a fluorine-passivated metal.

4. The CVD device of Claim 3, wherein of the piping is made of a metal selected from the group consisting of fluorine-passivated stainless steel, aluminum, and aluminum alloy.

5. The CVD device of Claim 1, wherein the piping comprises a through-flow type valve positioned between the remote plasma discharge chamber and the reaction chamber.

6. The CVD device of Claim 5, wherein the activated cleaning gas comprises fluorine active species and an inner surface of the valve is made of fluorine-passivated aluminum.

7. The CVD device of Claim 5, wherein the valve has an opening that, when fully open, defines a pressure drop across the valve of less than about 0.25 Torr.

8. The CVD device of Claim 7, wherein the pressure drop across the valve when fully open is less than about 0.1 Torr.

9. The CVD device of Claim 7, wherein the opening of the valve is sized, when fully opened, substantially equal in width to an inner surface of the piping, and the valve does not have projections, when fully opened, with respect to the inner surface of the piping.

10. The CVD device of Claim 5, wherein the piping and the valve are heated to a temperature effective to prevent deposition of the cleaning gas.

11. The CVD of Claim 1, further comprising a support provided within the reaction chamber, configured to support an object to be processed, and a gas-emitting plate provided at a position facing the support within the reaction chamber in order to supply reaction gas to the object to be processed to form a film on the object to be processed, wherein the activated cleaning gas is supplied through piping into the reaction chamber from holes provided on the gas-emitting plate.

12. The CVD device of Claim 11, wherein the gas-emitting plate is connected to a source of power to form an *in situ* plasma electrode for plasma CVD within the reaction chamber.

13. The CVD device of Claim 11, further comprising a gas conduit communicating with a source of reaction gas, wherein one end of the gas conduit is linked to the piping at a predetermined position between the valve and the gas-emitting plate.

14. The CVD device of Claim 1, wherein the piping is straight between the remote plasma discharge chamber and the reaction chamber.

15. The CVD device of Claim 1, wherein the energy activating the cleaning gas has a frequency between about 300kHz and 500kHz.

16. The CVD device of Claim 14, wherein the energy activating the cleaning gas has a power between about 1,500 W and 3,000 W.

17. The CVD device of Claim 1, further comprising a reaction gas inlet and a reaction gas outlet defining a horizontal flow across a substrate surface upon which material is deposited within the reaction chamber.

18. The CVD device of Claim 17, wherein the piping opens into the reaction chamber downstream of the inlet and upstream of a substrate support configured for supporting a substrate within the chamber.

19. The CVD device of Claim 17, wherein the reaction chamber comprises quartz walls and radiant heating elements.

20. A plasma chemical vapor deposition (CVD) reactor, comprising a reaction chamber, a remote plasma discharge chamber connected to the reaction chamber by piping, a source of cleaning gas in fluid communication with the piping upstream of the remote plasma discharge chamber, and a power source communicating energy with a frequency between about 300 kHz and 500 kHz to activate the cleaning gas within the remote plasma discharge chamber.

21. The plasma CVD reactor of Claim 20, wherein the remote plasma discharge chamber is formed of metal.

22. The plasma CVD reactor of Claim 21, wherein the remote plasma discharge chamber comprises anodized aluminum.

23. The plasma CVD reactor of Claim 20, wherein the cleaning gas comprises a fluorine containing gas, and the piping supplies fluorine active species to the reaction chamber.

24. The plasma CVD reactor of Claim 23, wherein the piping comprises internal surfaces formed of fluorine-passivated metal resistant to corrosion by fluorine active species.

25. The plasma CVD device of Claim 23, wherein the piping is heated to between about 100°C and 200°C.

26. The plasma CVD reactor of Claim 20, further comprising a source of CVD reaction gas in fluid communication with the remote plasma discharge chamber.

27. The plasma CVD reactor of Claim 20, further comprising a through-flow type valve on the piping between the remote plasma discharge chamber and the reaction chamber, the valve being configured such that, when fully opened, it defines an opening substantially equal in width to an inner surface of the piping, and the valve does not have projections, when fully opened, with respect to the inner surface of the piping.

28. The plasma CVD reactor of Claim 27, wherein a pressure drop is formed across the valve when fully opened and plasma is ignited within the remote plasma discharge chamber, the pressure drop being less than 1% of a pressure at an inlet to the chamber.

29. The plasma CVD reactor of Claim 20, wherein the cleaning gas comprises a fluorine-containing gas and the power source communicates energy with a power between about 1,000 W and 5,000 W to produce fluorine active species within the remote plasma discharge chamber.

30. The plasma CVD reactor of Claim 29, wherein the power source communicates energy with a power between about 2,000 W and 3,000 W to produce fluorine active species within the remote plasma discharge chamber.

31. The plasma CVD reactor of Claim 20, configured to maintain pressure within the reaction chamber between about 1 Torr and 8 Torr.

32. The plasma CVD reactor of Claim 20, capable of removing silicon nitride deposits from surfaces of the reaction chamber at a rate of greater than or equal to about 2.0 microns/minute when the power source communicates energy with a power of less than about 3,000 W.

33. A plasma chemical vapor deposition (CVD) device comprising:

a reaction chamber having walls;

a remote plasma discharge chamber connected to the reaction chamber by piping;

at least one gas source connected to the remote plasma discharge chamber by piping; and

a power source, connected to the remote plasma discharge chamber, that applies power to the remote plasma discharge chamber of between about 500 W and 3,000 W,

wherein the device is capable of removing silicon nitride deposits adhered to the walls of the reaction chamber at a rate of greater than or equal to about 2.0 microns/minute when the power source communicates energy with a power of less than about 3,000 W.

34. The CVD device of Claim 33, wherein the walls of the reaction chamber comprise quartz.

35. The CVD device of Claim 33, wherein the remote plasma discharge chamber is formed of metal.

36. The CVD device of Claim 33, wherein the at least one gas source comprises a plurality of gas sources.

37. The CVD device of Claim 36, wherein at least one of the plurality of gas sources comprises a source of CVD reaction gas connected to the remote plasma discharge chamber.

38. The CVD device of Claim 36, wherein at least one of the plurality of gas sources comprises a source of a cleaning gas containing fluorine.

39. The CVD device of Claim 38, wherein the piping comprises internal surfaces formed of metal resistant to corrosion by an active species of the cleaning gas.

40. The CVD device of Claim 39, wherein the internal surfaces are formed of fluorine-passivated metal resistant to corrosion by fluorine active species

41. A self-cleaning chemical vapor deposition (CVD) reactor, comprising a reaction chamber, a remote plasma discharge chamber connected to the reaction chamber by piping, a gaseous source of fluorine in fluid communication with the piping upstream of the remote plasma discharge chamber, the piping comprises a through-flow type valve positioned between the remote plasma discharge chamber and the reaction chamber, and a power source communicating energy with a frequency between about 300 kHz and 500 kHz to activate fluorine within the remote plasma discharge chamber.

42. The CVD reactor of Claim 41, wherein a pressure drop is formed across the valve when fully opened and plasma is ignited within the remote plasma discharge chamber, the pressure drop being less than about 5% of a pressure at an inlet to the chamber.

43. The CVD reactor of Claim 42, wherein the pressure drop is less than about 1% of the pressure at the inlet.

44. The CVD reactor of Claim 42, wherein an internal surface of the piping comprises a fluorine-passivated metal.